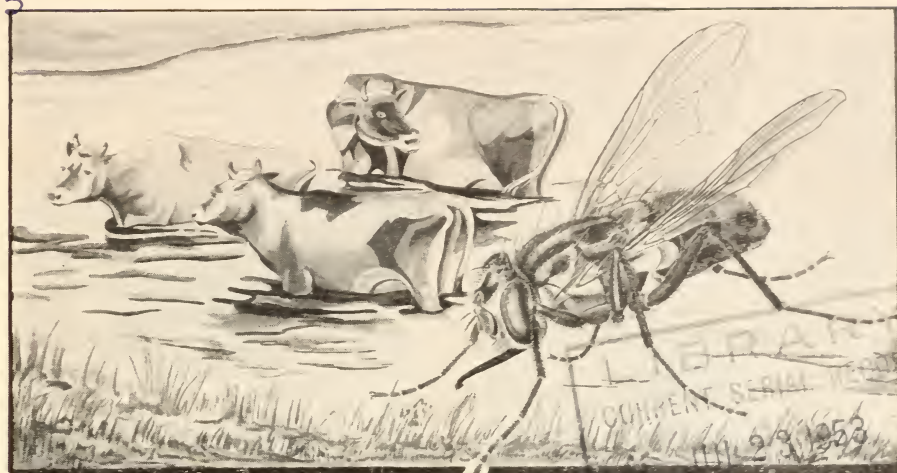


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U. S. DEPARTMENT OF AGRICULTURE

Stable Flies

HOW TO CONTROL THEM

When farm animals are attacked by stable flies, they stamp, run, stand in water, bunch up, and in other ways try to escape from the torment of the flies' deep-piercing bites.

The animals lose blood—and they are fighting flies when they should be feeding.

The stable fly also annoys man. Along the Gulf and Atlantic coasts, the pest frequently becomes extremely annoying to people as well as to livestock. On beaches and in picnic areas, attacks by these flies often become unendurable; people take cover or leave.

Stable flies are found in all parts of the United States, and are especially numerous in the Central and South-

eastern States and in irrigated sections and some coastal areas.

Animals most commonly attacked are mules, horses, cattle, hogs, dogs, cats, sheep, and goats. In some parts of the country stable flies are known as dog flies; they attack dogs viciously, particularly around the ears.

The scientific name of the stable fly is *Stomoxys calcitrans*.

WHAT THEY LOOK LIKE

The stable fly is grayish to black with four dark lines on the thorax and several dark spots on the abdomen. It looks much like the house fly, but has mouth parts that enable it to pierce the

skin of animals and suck blood. The house fly does not bite; its mouth parts are soft and broad on the tip. The biting tip of the stable fly's beak protrudes forward and well beyond its head.



The stable fly: Adult female as seen from above. Greatly enlarged.

The stable fly also resembles the horn fly, another livestock pest, but the stable fly is the larger. Another difference is this: When it alights on an animal, and when resting, the stable fly stands with its head up; the horn fly, usually found only on cattle, rests with its head downward and with wing tips less widely spread.

THEIR FEEDING HABITS

Adult stable flies feed only on blood. When only a few are attacking an animal, they usually concentrate on the lower portion of the forelegs. When they are abundant, however, they attack any part of the animal.

They feed by inserting the beak and sucking blood. Most of the torment suffered by animals apparently results from the irritation produced when the beak is inserted. After blood extraction has begun, animals seem to suffer less.

As the fly feeds, its abdomen swells and turns reddish. When satisfied, it pulls out its beak and flies sluggishly to some nearby object, where it rests and digests its meal.



The stable fly: Adult female engorged with blood; side view. Greatly enlarged.

After feeding, stable flies often rest on the walls of barns and on trees in and around barnyards. They are found on the sunny side when it is cool and in the shade when it is hot. They do not enter buildings freely, especially if the interior is rather dark.

In warm weather the fly digests blood quickly and may feed more than once during a day. In cool weather digestion takes a day or longer.

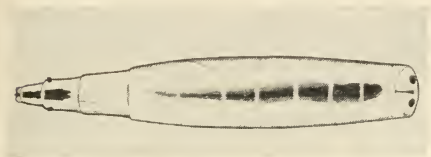
HOW THEY DEVELOP

Like all other flies, the stable fly has four stages in its life cycle—egg, larva (or maggot), pupa, and adult.

The flies breed in wet straw, manure, vegetable and fruit refuse, peanut litter, and (along the coast) marine-grass windrows. The eggs, minute and creamy white, are laid in these moist, fermenting substances. They hatch in 1 to 3 days.

As soon as they are hatched, the larvae begin feeding on bits of moist straw or other material comprising the breeding place. When hatched, the larvae are translucent and not easily seen with the naked eye. When full grown, they are pale yellow or nearly white, and about $4/5$ inch long.

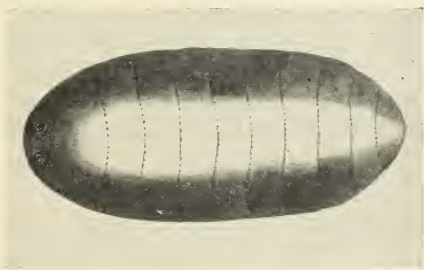
The larval period lasts 11 to 30 or more days; in very cold weather it may last considerably more than a month. Temperature, moisture, and type and amount of food influence development.



**The stable fly: Larva, or maggot.
Greatly enlarged.**

As the breeding material becomes dry on the surface, the larvae follow the moisture inward. They cannot live long in the absence of moisture, or where exposed to sun, wind, and light.

When the larvae are full grown, they shorten and become thicker, and the skin contracts to form the pupal case, in which they transform to adults. The case is about $\frac{4}{5}$ inch long. Rather soft and yellowish at first, it soon hardens and changes to reddish brown.



The stable fly: Pupa. Greatly enlarged.

When the fly has finished developing, in 6 to 20 days, it pushes open the case and crawls out. The adult lives several weeks.

Under favorable conditions the stable fly develops from egg to adult in about 3 weeks. Thus there may be several generations in one season.

In northern climates the insects usually overwinter in the larval and pupal stages. In the South, flies are present during warm periods throughout the winter, and breeding is continuous.

HARMFUL EFFECTS

Most stable flies reach the adult stage late in the summer and in the fall. During this period, if the flies are present in large numbers, animals have to fight them from early morning until dark, and become weakened by the constant exertion and loss of blood. Animals thus weakened sometimes become unable to keep up their fight against the pests; they "give up"—and then the flies attack them in increased numbers. Also, animals may be weakened to the point where they become more susceptible to disease; and the flies may pass certain diseases along from one animal to another.

Animals that stand in water day after day to escape the flies may develop swollen feet and joints. In swampy places they may become mired and die.

When the flies are moderately abundant, animals do not make maximum weight gains, and milk production of dairy cattle may be reduced by 10 percent or more. During severe outbreaks, beef cattle become so thin that they cannot be sold profitably, and milk production may be reduced 50 percent or more. Low milk production may continue for several months after the fly season is over.

METHODS OF CONTROL

Destroy Breeding Places

The first and most important step in the control of stable flies is to destroy their breeding places.

Destruction of stable flies' breeding places means sanitation and orderliness around the farm. If a substance used as a breeding place has value—manure, for example—dispose of it properly or apply an insecticide. Get rid of vegetable and fruit refuse and garbage.

Following are suggestions for destroying, or for making inaccessible to the flies, the substances that commonly serve as breeding places:

WET STRAW

In stacking straw, keep the sides of stacks nearly vertical and the tops well rounded. Clean up around the bases. From such places originate the outbreaks of stable flies in many areas. It is well to bale straw required for feed or bedding soon after thrashing. Oat straw is especially favorable for stable fly breeding. When rain ruins a strawstack, scatter the straw. Plow it under if it is practicable to do so, or disk before seeding. In harvesting with combines, see that the straw remaining in the fields is not left in piles. In the spring scatter the butts of strawstacks that were not eaten by livestock during the winter.

MANURE

Manure is a breeding place not only for stable flies but also for house flies. You can control both these flies by using proper means of disposing of manure.

Haul manure from the stable and barnyard and spread it thinly on the fields at least twice a week. Get rid of waste straw, hay, ensilage, or fodder that may be lying near the stable. The stable fly breeds in these materials, especially when they become mixed with manure.

If you have only a few head of stock, or if the manure cannot be scattered on fields regularly, make a manure box or dig a pit. Do the best you can to make it flyproof, and attach a conical flytrap over an opening in the top. Put all manure into it daily or at least twice a week.

If you do not have a manure box or pit, kill larvae in the manure by scattering borax over the pile. Use 1 pound of powdered borax for each 16 cubic feet of manure. Then sprinkle water over the pile. Borax used in the quantity indicated will not lessen the fertilizing value of the manure if you do not spread the manure too heavily.

Do not spread more than 15 tons to an acre.

You may also spray the pile with DDT or chlordane. Prepare a wettable-powder or emulsion spray containing 1 percent of DDT or 0.5 percent of chlordane. Use enough of the spray to get the surface thoroughly wet.

Killing larvae in manure helps not only the farmer but also the city dweller. Flies developing from larvae and pupae in stable manure brought to a city garden may cause annoyance for weeks.

VEGETABLE AND FRUIT REFUSE

If refuse from vegetable- and fruit-packing plants is allowed to accumulate and ferment when adult stable flies are around, large numbers of them may breed in it.

Just as sanitation is the first rule in controlling flies on the farm, so it is the first rule in controlling them on packing-plant premises. Waste materials such as corn husks and cobs, celery, and other vegetable trimmings are breeding places not only for stable flies but also for house flies and vinegar flies, which often become a menace in the packing plant.

Waste material that cannot be quickly disposed of should be sprayed with an insecticide to prevent fly breeding. If the waste is not to be fed to livestock, use a spray containing 1 percent of DDT or 0.5 percent of chlordane. If the waste is to be fed to livestock, remove it and feed it to the stock at least twice a week.

Crushing of waste in the plant greatly reduces its volume and its moisture content, and makes insecticide treatment easier.

Dumping of vegetable and fruit waste onto small dumping areas will not prevent fly breeding. Even if the waste is plowed or disked under, some fly breeding may occur.

How To Prepare Sprays for Stable Fly Control

The chart below shows how to prepare sprays in the concentrations suggested in this leaflet. The percentage of insecticide in commercial products varies. If you buy a wettable powder or an emulsifiable concentrate in which the percentage of insecticide is different from that indicated in the left-hand column of the chart, take this fact into account in determining the amount to mix with water. The amount will be different from that indicated in the right-hand columns.

Insecticides, and some of the forms in which they may be purchased	Percent of insecticide desired in spray	Amount of purchased product to mix with water	
		With 100 gallons	With 5 gallons
METHOXYCHLOR AND DDT			
50-percent wettable powder.....	0.5.....	8 pounds.....	6.5 ounces.
	1.0.....	16 pounds.....	13 ounces.
	2.5.....	40 pounds.....	2 pounds.
25-percent emulsifiable concentrate.....	0.5.....	2 gallons.....	0.8 pint.
	1.0.....	4 gallons.....	1.6 pints.
	2.5.....	10 gallons.....	0.5 gallon.
	5.0.....	25 gallons ¹	1.25 gallons.
LINDANE			
25-percent wettable powder.....	0.3.....	10 pounds.....	0.5 pound.
	0.4.....	13 pounds.....	11 ounces.
	0.5.....	16 pounds.....	14 ounces.
20-percent emulsifiable concentrate.....	0.3.....	1.5 gallons.....	0.6 pint.
	0.4.....	2 gallons.....	0.8 pint.
	0.5.....	2.5 gallons.....	1 pint.
CHLORDANE			
40-percent emulsifiable concentrate.....	0.5.....	1.25 gallons.....	0.5 pint.
	2.0.....	5 gallons.....	2 pints.

¹ Or 20 gallons with 80 gallons of water.

About a week before a plant is put into operation, apply a spray containing DDT, methoxychlor, or lindane to surfaces in and around the plant, but take care not to spray surfaces where food products are being processed. The concentration of insecticide that is desirable in the spray depends on whether an emulsifiable concentrate or a wettable powder is used. The proper percentages are shown below.

Spray	Percent of insecticide	
	Emulsifiable concentrate	Wettable powder
DDT or methoxychlor..	5.0	2.5
Lindane.....	0.4-0.5	0.3-0.4

While the plant is in operation, use a synergized pyrethrum space spray inside the plant, but avoid direct application to the food products. Outside, spray surfaces on which flies gather.

PEANUT LITTER

In the Southeast, where peanuts are an important crop, piles of litter are left in the fields after the peanuts have been picked and the vines baled for hay. When the litter becomes wet, stable flies often breed in it.

Immediately after harvest, bale all litter that is suitable for feed, or store it under cover. Scatter what is left in the field and plow it under.

During the fly season remove peanut litter, hay, and manure from around feed troughs and barns. Haul it to the

fields twice a week. Scatter it thinly so that it will dry quickly. Do not plow it under until it has dried.

Where it is not practicable to spread infested litter immediately, apply a spray containing 1 percent of DDT or 0.5 percent of chlordane. Wet the surface thoroughly. You may need 5 to 10 gallons of spray for each 500 square feet. DDT is not highly effective against the large larvae, but after the flies emerge they will crawl over the surface and will be killed by the DDT that has been deposited.

Do not feed insecticide-treated litter to livestock.

MARINE-GRASS WINDROWS

Stable flies breed in fermenting marine grass that is washed into windrows on ocean beaches above normal tidelines.

Destroy eggs, larvae, and adult flies in these beach deposits by applying a spray containing 1 percent of DDT or 0.5 percent of chlordane. Use a high-pressure power sprayer mounted on a truck. Some of the deposits may be in places that are a considerable distance from land on which a truck can be driven. Therefore the truck should be equipped with sufficient hose to reach these places. Several hundred feet may be needed.

You may need a boat, with a sprayer mounted on it, to reach some of the deposits.

Kill Flies in Dairy Barns

Methoxychlor and lindane are the only insecticides now recommended as surface sprays for fly control inside barns where cows are milked or in places on the farm where milk is processed. You can buy them as wettable powders or as emulsifiable concentrates. In addition to these surface sprays, you may use mist or space sprays or aerosols containing pyrethrum or organic thiocyanate insecticides.

PRECAUTIONS

Carefully read the directions on the label before using insecticides or preparing sprays.

Many insecticides are poisonous. Careless handling or improper application may injure people or animals, or may poison food.

Do not expose the skin to insecticides unnecessarily.

Do not apply insecticides to feed, feed troughs, water tanks, or milking utensils.

Do not apply insecticides to food, products that are to be used in food, or drinking fountains.

Cut off the power before applying a residual spray to electric wires or fuse boxes.

Do not strike a match or smoke when applying an inflammable spray.

Do not apply oil solutions to animals in amounts that will wet the skin.

METHOXYCHLOR

The spray should contain 2.5 percent of methoxychlor if you use a wettable powder, and 5 percent if you use a concentrate. On most surfaces the powder spray is the more effective.

LINDANE

The spray should contain 0.3 percent of lindane if it is to be used on rough surfaces. A higher concentration, 0.5 percent, is desirable for treating smooth surfaces, especially if the spray is made from an emulsifiable concentrate.

Kill Flies in Other Places

An insecticide should be used to kill stable flies not only in dairy barns but also in other farm buildings and outdoors. Treat the outside of the dairy barn, and the outside and inside of beef-cattle barns, stables, sheds, pigpens, and poultry houses. Treat coral fences, tree trunks (up to a height of about 10 feet), and low-hanging limbs.

Spray until the surfaces are wet to the point of runoff. A gallon of spray will treat from 500 to 1,000 square

feet, depending on whether the surface is rough or smooth, absorbent or non-absorbent. Since much of the spray runs off smooth, nonabsorbent surfaces, apply it to such surfaces at the rate of a gallon to 500 square feet.

Compressed-air hand sprayers are all right for small jobs, but for most purposes power sprayers are better. Adjust the pressure to about 100 pounds per square inch.

METHOXYCHLOR AND LINDANE

These insecticides, recommended for use in dairy barns, are effective against flies elsewhere on the farm. The concentrations are the same as those recommended for dairy-barn sprays (see above).

DDT

DDT is recommended for use as a surface spray, but it should not be used in dairy barns or in milk rooms. It remains effective for weeks or months, depending on whether the treated surface is outdoors or indoors.

Use a wet spray of DDT—either a 5-percent emulsion spray (made from an emulsifiable concentrate) or a 2.5-percent suspension (made from a wettable powder).

CHLORDANE

Chlordane, used in some areas to control DDT-resistant house flies, is also effective against stable flies. Use a 2-percent spray.

Do not use chlordane inside dairy barns or milk rooms.

Spray Farm Animals

Stable flies stay on animals only long enough to get a meal of blood. Therefore spraying the animals is less effective than spraying the premises. But it is a desirable additional measure during severe outbreaks.

Dairy cows are the animals most commonly sprayed. Do not neglect other farm animals—especially horses, mules, and beef cattle.

Insecticides sprayed on horses and mules that are working remain effective only for short periods, because they are washed away by perspiration.

Pyrethrum is the insecticide that gives livestock the best protection from attack by stable flies. It can be used either in a mist or in a wet spray. Methoxychlor is effective when used as a wet spray.

MIST SPRAYS

For many years dairymen have been using hand or small power sprayers to apply a light mist of insecticide on cattle at milking time.

Mist sprays, which can be purchased ready for use, usually have an oil base and contain pyrethrum or an organic thiocyanate. A pyrethrum spray contains a synergist, such as piperonyl butoxide, *n*-propyl isome, sulfoxide, or sesame oil. The pyrethrin content of a pyrethrum mist spray for livestock should be about 0.05 percent.

LET CATTLE SPRAY THEMSELVES

The Illinois Natural History Survey has devised a chute, with a sprayer attached, that enables cattle to spray themselves.

The device is activated when an animal steps onto a metal floor, one side of which is connected with an upright rod. The rod is connected with a small pump, which operates a sprayer. By stepping on the floor, the animal forces down the pump plunger. One side of the animal is sprayed as it

goes into an enclosure for salt or water, the other side as it comes out.

Designed originally for horse fly control, this automatic spraying device is highly effective against horn flies and is also useful against stable flies. However, a second sprayer should be added at leg level, where stable flies most often attack.

You can get directions for making the chute from the Illinois Natural History Survey, Urbana, Ill.

Since sprays that are to be applied as mists usually have an oil base, be sure to apply them lightly. Treat only the outer hair coat of the animal. *Never wet an animal's skin with an oil spray.* Oil alone can injure animals severely. In mist-spraying cattle, do not apply more than 2 ounces to an adult animal at one time. A treatment repels flies 4 hours or longer.

WET SPRAYS

Wet sprays are so called because they are used in an amount sufficient to wet the animals. On a single-treatment basis, they cost more than mist sprays, because more insecticide is applied, but treatments are needed less frequently.

Pyrethrum sprays affect flies so rapidly that they leave the animals at once; they do not stop to feed. Use an emulsifiable concentrate that contains 1 percent of pyrethrins plus a synergist. Mix 1 part of the concentrate with 19 parts of water.

Methoxychlor does not repel the flies, but flies that bite the animals during the first 3 days after a treatment are killed. The animals are thus spared from repeated attacks by the same flies. Prepare a 0.5-percent spray from a wettable powder or an emulsifiable concentrate.

In wet-spraying cattle, use from 1 to 2 quarts of pyrethrum spray, or about 2 quarts of methoxychlor spray, on each adult animal. It may be necessary to spray dairy cows twice a week. In some sections of the country, cattle owners use wet sprays containing 1.5 percent or more of methoxychlor, rather than the 0.5-percent spray sug-

gested above, but they reduce the amount of spray per animal proportionately.

Apply wet sprays with a power, compressed-air, or knapsack sprayer. If you wish to apply methoxychlor with a hand sprayer, the job will probably be easier if you use an emulsion spray rather than one made from wettable powder.

Darken Sheds and Barns

When stable flies are numerous, much relief to livestock can be provided by darkening sheds with burlap curtains and allowing the animals to rest therein. Putting burlap over barn windows will keep most stable flies out.

OUTDOOR GATHERINGS

At picnics and other outdoor gatherings, use a repellent to keep stable flies from annoying people. Indalone, which may be purchased ready for use, is satisfactory for this purpose. Apply it to the ankles and on parts of clothing that are near the places where the flies bite.

Some relief can be obtained by spraying DDT, methoxychlor, lindane, or pyrethrum lightly on vegetation and other surfaces in the vicinity of the gathering. Make a spray containing 1 percent of DDT or methoxychlor or 0.3 percent of lindane.

Applying ordinary household sprays containing pyrethrum on vegetation, benches, chairs, and other surfaces just before the gathering, or drifting a mist spray or aerosol among the people, will kill flies that are present, and will help keep other flies away.

THIS LEAFLET was prepared by the Division of Insects Affecting Man and Animals, Bureau of Entomology and Plant Quarantine, Agricultural Research Administration. It brings up to date information on stable fly control that is presented in Farmers' Bulletin 1097, *The Stable Fly: How To Prevent Its Annoyance and Its Losses to Livestock*, by F. C. Bishopp, and supersedes that publication.

Washington, D. C.

Issued May 1953

U. S. GOVERNMENT PRINTING OFFICE: 1953

